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THE EFFECTIVENESS OF CARTOGRAPHIC METHOD AS A TOOL IN ILLUSTRATION OF RESEARCH DATA: A CASE STUDY OF DELTA UNIVERSITY, ABRAKA-NIGERIA

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Abstract. This research work examined the effectiveness of cartographic method as a tool in the illustration of research data, by examining the role cartographic method has over descriptive method, it effectiveness, and process involved; in Delta State University Abraka. In line with these a structured questionnaires were administered to 200 student from various levels of study; that is from 100 to M.sc level and some questionnaire were also administered to some lecturers of the department in other to obtain information on the effectiveness of cartographic method usage. The data generated where analysed using the spearman's rank correlation and the student's' test. For the spearman rank analysis, the test revealed that the calculated t value (8.53) is greater than the tabulated t value (2.35) at 5% level of significance, the student't' test analysis showed that the calculated t value (0.00) is less than the tabulated value (2.78) at 5% level of significance. The result of the research at the end of the day reveals that, there is a strong relationship within all the level of study based on the cartographic technique employed in research data illustration. On the other hand, with the use of statistical diagram and map, it shown that with the information extracted there is no strong relationship between the two methods. Based on the findings, recommendations were made on the use of cartographic method toward adequate coverage of the entire study topic.

Keywords: statistical diagram, statistical mapping, mapping, cartographic.

Introduction

Today, maps can be produced easily through a wide range of online tools by anyone with access to the Internet. Maps used in most activities (from urban planning, through geological exploration or environmental management, to trip planning and navigation), however, they are still typically produced by professionals with expertise in mapping or in the phenomena being depicted on the maps. The academic and professional field that focuses on mapping is called "cartography". Cartography has been defined by the International Cartographic Association as "the discipline dealing with the conception, production, dissemination and study of maps". One useful conceptualization of cartography is as a process that links map makers, map users, the environment mapped, and the map itself (Ufuah 2005).

Just as the use of electronic machine (computer) for the processing of data, one of the methods adopted by geographer's/researcher in processing or illustration of research data is by means of geographic analysis (cartographic method), for effective summarization of data to avoid statistical indigestion and statistical congestion (Olomo 1997).

Statistical mapping of data, usually revolve round two basic process, firstly is the the representation geographic information collected on the map-location by graticule or grid co-ordinate. Secondly it is also concerned with the interpretation of quantitative and non-quantitative symbols (Adeyemi 1982). Adalemo (1985), based on the fact that map is a model seen as they are important as they are two –dimensional scale models and thus offer a good means of representing feature over space-this making map a scale model. Wood carried out a work in which he was trying to represent the changes that take place in two ways basically. That in any given locations, or within specified areas, changes in volume or quantity have to be treated

like any other quantity applied to a point or area. He cited an example that changes in urban population over a period of time many be shown by proportional symbols while changes in total population within administrative areas need to be shown as series of graded sub-classes.

Balogun (1978) identified experience in map interpretation age and education, cultural background, imagination, interest, temperament as human factors that affect retrieved cartographic information. With long experience in the area of cartographic method (analysis) as a tool in illustration of research data, cartographers have much to contribute of it scientifically the cartographers should be called and oriented to engage their experience and creativity in applied autographic method (computer GIS). Wood in 1972 carried out a work in which, he was trying to represent the changes that take place in two ways basically (changes in volume or quantity). That in any given locations or within specified areas, changes in volume or quantity have to be treated like any other quantity applied to a point or area. He cited an example that changes in urban population over a period of time may be shown by proportional symbols while changes in total population within administrative area need to be shown as a series of graded sub-classes, this is based in the same manner as other quantities applied to areas, weather the distribution is actually continuous or not.

Afolakemi (2004) and Rilwani (2006) both stress that for research's, maps not highlights problems for academic research, but also acts as tool for the investigation of the academic research problem, as well as for analysis and presentation of results.

There are many cartographic techniques available for mapping the spatial distribution of features on the earth surface, broadly the techniques can be grouped into two: Statistical diagrams (used when the data to be represented refer to one place or, where several localities are involved to show relationship between quantities and proportions formed by constituents parts) and Statistical maps (spatial distribution of what is represented is very important and therefore need a base map.

However illustration of research data using cartographic method has been of very importance, with the advent of GIS and other geospatial technologies illustration of geospatial data is more viable and accessible as a new trend in the geospatial world (market) today.

1. Research methodology

1.1. Study area

The study area is cantered around Abraka of Ethiope East Local Government Area of Delta State, with particular reference to (Delta State University, Abraka). Abraka is located on latitude 5°48X and 5°48X North and Longitude 6° 05X and 6°08X East of the Greenwich meridian. It is located on the eastern part of Isiokolo, the local government area headquarter. In the North is bounded by River Ethiope, in the East by Urhuoka, in the south by Abraka Island and in the West by Ajalom. See Figure 1 below.

1.2. Source of data

The data for the research were derived from two main sources through field survey and documentary sources

The field surveys (primary source) of data were derived from the use of well-structured questionnaire, which was administered to a sampled population of student and lecturer in the department of Geography and Regional Planning of Delta State University Abraka. The random sampling technique was used to sample student (from one hundred levels to master level).

The documentary data sources used for the research includes relevant textbooks, journal papers, magazines, unpublished lecture notes, unpublished research essay and the internet.

1.3. Methods

A total of 200 questionnaires were administered accompanied with hypothetical map like bar graph, choropleth map, dot map and Isopleth map. Out of this

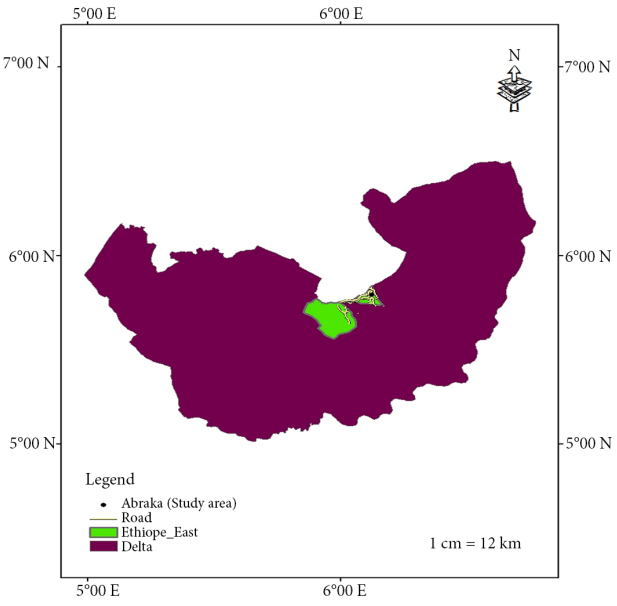

Fig. 1. Map of Delta state showing the study area

Table 1. Distribution of level of study respondent

Sampled level	100	200	300	400	M.sc	Lecturer	Total
Numbered distributed	50	50	40	30	15	15	200
%	25	25	20	15	7.5	7.5	100

Source: Field work 2016.

185 to students from hundred levels to master degree level, 15 questions were administered to lecturers in the department of geography and regional planning.

Out of the 200 questionnaire, 50 were administered to 100 level students as well 50 to 200 level students (accounting for 25% each for 100 and 200 level), 40 question to 300 level student (accounts for 20%), 30 to 400 level students (accounts for 15%), 15 to master degree (M.sc) students (accounts for 7.5%),15 to lecturers (account for 7.5%); at of all the questionnaire administered to students about 167 (83.5%) were recovered from 100 to M.sc students and 13 (16.5%) from lecture of the department of Geography and Regional Planning. See table 1 and Figure 2 below for details.

The question in general consists of two categories (category A and category B). The category A been students question is made up of three part A B C, in which the part B is made up of three sections from A to C. While the part A is made up of two sections namely A and B. The last part C is just on his own.

PART A: With the following section namely

Section A: for personal information

Section B: Test question, consists of 10 questions; was scored 2½ marks each Making a total of 25 marks.

PART B: With the following section namely

Section A: The test questions also, consist of 3 questions; was scored 2 marks each, making a total of 6 Marks.

Section B: Demarcate and delimits question consists of 4 questions with 3 marks each, making a total 12 marks.

Section C: Inference, cost estimate question consists of 4 questions with 3 marks each making a total of 12 marks.

With this the total scores for the test is 55 marks. The part C questions, where mainly opinion questions. The category B was also well structured question of about 18 questions for both personal information and general questions which were administered to the lecturer of the department of Geography and Regional Planning Delta State University Abraka.

Based on the fact that the data derived where in interval format the student 't' test and spearman rank's correlation analysis was used for hypothesis testing. The data were also illustrated using percentage tables.

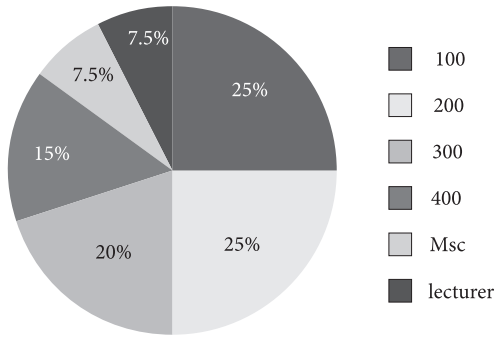

Fig. 2. Pie charts showing percentages of questionnaire distributed

1.4. Scores in representation and extraction of information-using cartographic method

The scores of individual respondent (within each level of study) to the questions provided by the researcher is very vital when looking at the amount of cartographic method (map) data represented and extracted by map user, especially the statistical diagram and statistical map users. From the finding it was evident that on the general score, that is total score for all the sections the highest score for the 5 level of study was 52, which scored was by two 400 level student, while the lowest score was 6, score by one 100 level student based on the general total score of 55, the least any one could score was peg at 0,while the highest was stipulated to be 55, based on this a class interval of 0–11, 12–22, 23–33, 34–44 and 45–55 was structured to illustrate the range of score for each level of study.

From the general score, a student's score between 0–11 marks this account for 0.6% of the total sampled population. This student who is from 100 level (accounts for 2% of 100 level study sampled. Also from the general score, 5 student scored between 1222 and this account for 3.0% of the sampled population, 2 of this student are 100 level students (accounting for 4.1% of the 100 level sampled); A student from 200 level accounting for 2.5% of the 200 level sampled and two remaining student from 300 level and 400 level respectively accounting for 2.9% and 3.3% sampled of 35 and 30 sampled for 300 and 400 level respectively.

59 students scored marks between 23–33 marks accounting for 35.3% of the sampled population. 15 of these are 100 level students, accounting for 30.6% of 100 level of study sampled; 16 from 200 level students, accounting for 40% of 200 level sampled; 18 from 300 level students (accounting for 51.4% of the sampled in that level; 6 from 400 level accounting for 20% of students sampled in that level; 4 from M.sc level, accounting for 30.8% of students in that level.

In another score group 90 students' score between 34–44 marks accounting for 53.9% of the sample population; 29 of these value were 100 level student, accounting for 59.2% of the 100 level sampled; 22 from 200 level, accounting for 50% of the 200 level sampled;15 from 300 level, accounting for 42.9% of the level sampled;19 from 400 level, accounting for 63.3% of the 400 level sampled; 5 from M.sc level, accounting for 38.5% of their student sampled.

Lastly on the score recorded, 12 students scored between 45–55 marks accounting for 7.2% of the sampled population. 2 student from 100 level students, accounting for 4.1% of the level sampled; a student each from 200 level and 300 level students each accounting for 2.5% and 2.9% of the student sampled for each level respectively; 4 student from 400 level accounting for 13.3% of the level sampled; and also 4 students from M.sc level accounting for 30.8% of the sampled population of that level. The general score distribution and percentage distribution of respondents with respect to individual level of study in sampled area is clearly and neatly shown in the two table below.

1.5. Score from statistical mapping test of respondents

The score from this section is to generate data that will help or form as an indicator of student individual level of study to be able to represent and extract information using maps; such as dot maps, isopleth and choropleth maps. This aspect of the research succinctly looks into the students in each level knowledge, which definitely reflect on how they can identify and locate certain criteria in the the maps. The data and information for analysis were derived from the scores from Part B, section B of the administered questionnaire. Based on the making scheme, the highest a student or respondent from the sampled population could score is 12 marks while the least score is 0. Therefore a score interval was constructed to illustrate the score; they are 0–4, 5–8 and 9–12 marks.

From the finding of the research, 30 students scored marks between 0–4 and this accounted for 18% of the total sampled population of 167 students.10 of these are 100 level students (accounting for 20.4% of 49,100 sampled); 3 from 200 level (accounting for 7.5% of 40,200 level sampled); 10 from 300 level (accounting for 28.6% of 35,300 level sampled); 7 from 400 level (accounting for 23.3% of 30,400 level sampled).

54 student scored between 5–8 marks, and this accounts for 32.3% of the 167 student sampled. 11 of these are 100 level (accounting for 22.4% of 49 students sampled); 15 from 200 level (accounting for 37.5% of 40 students sampled); 10 from 300 level (accounting for 28.6% of 35 students sampled); 10 from 400 level (accounting for 33.3 of student sampled); 8 from M.sc level (accounting for 61.5% of the student sampled).

Lastly, 83 students scored marks between 9–12 marks and this account for 49.7% of the total 167 students sampled. 28 of these, from 100 level (accounting for 57.1% of the 49 students sampled); 22 from 200 level (accounting for 55% of the 40 students sampled); 15 from 300 level (accounting for 42.9% of the 35 students sampled); 13 from 400 level (accounting for 43.3% of the 30 students sampled); 5 from M.sc level (accounting for 38.5% of the student sampled); The general distribution of score and percentage of score interval of respondents with particular reference to the

Table 2. Level of study score

S/N	level of study	0–11	12–22	23–33	34–44	45–55	Total observed
1	100	1	2	15	29	2	49
2	200	–	1	16	22	1	40
3	300	–	1	18	15	1	35
4	400	–	1	6	19	4	30
5	M.sc	–	–	4	5	4	13
TOTAL		1	5	59	90	12	167
%		0.6	3.0	35.3	53.9	7.2	100

Source: Field work 2016.

statistic mapping section from the tests questions the various levels (University) is shown in Table 3 and 4 respectively.

1.6. Score from statistical diagram test respondent

Statistical diagram and statistical mapping are main two weapon used, when assessing student comprehensive knowledge use of maps (as map users). Based on the students ability to represent and extract information using the cartographic method in research data illustration, especially the bar graph and line graph technique.

The information for analysis was derived from the score from part B; section C of the administered questionnaire. In line with the marking scheme, the least score is projected to be 0 while the highest students score is pegged at 12 marks. Therefore a score interval was structured to illustrate the score. They are 0–4, 5–8, 9–12 marks.

From the finding of the research 26 student scores marks between 0–4 marks accounting for 15.6% of the 167 sampled population.8 of these from 100 level (accounting for 16.3 % of 49 100 sampled); 3 from 200 level (accounting 7.5 of 200 level sampled); 10 from 300 level (accounting for 28.5% of 300 level sampled); 5 from 400 level (accounting for 16.6% of 400 level sampled). 67 students' score between 5–8 marks and this account for 40.1% of the 167 student total sampled. 11 of these, 100 level student (accounting for 22.4% of the 100 level sampled); 19 from 200 level (accounting 47.5 % of the 200 level sampled); 18 from 300 level (accounting for 51.4% of the 300 level sampled); 12 from 400 level sampled); 7 from M.sc level (accounting for 53.8% of the M.sc level sampled). 74 students scored marks between 9–12 marks and this accounts for 44.3% of the total 167 students sampled. 30 of these from 100 level students (accounting for 61.2% of the 100 level sampled); 18 from 200 level (account for 45% of the 200 level sampled); 7 from 300 level (accounting for 20% of the 300 level sampled); 13 from 400 level (accounting for 43.3% of the 400 level sampled); 6 from M.sc level (accounting for 46.1% of the M.sc level sampled).

The general distribution of scores and percentage of score interval of respondents with respect to statistical diagram section from the test questions is shown in table 6 and 7 respectively.

1.7. Response from lecturers in the level of study sampled

In a way to fulfil the purpose of the dissertation work, the researcher tends to seek the opinions of the

Table 3. Distribution of scores of statistical mapping test questions within level of study

Level of study	0–4	5–8	9–12	Total Observed
100	10	11	28	49
200	3	15	22	40
300	10	10	15	35
400	7	10	13	30
M.sc	–	8	5	13
Total	30	54	85	167
%	18.0	32.3	49.7	100

Source: Field work 2016.

Table 4. Percentage distribution of score interval of statistical mapping test question

Level of study	100	200	300	400	M.sc
% Score Interval	%	%	%	%	%
0–4	20.4	7.5	28.5	23.3	–
5–8	22.4	37.5	28.5	33.3	61.5
9–12	57.1	55.0	42.9	43.3	38.5
Total %	100	100	100	100	100

Source: Field work 2016.

Table 6. Distribution of score of statistical diagram test question in the various level of study

Level of study	0–4	5–8	9–12	Total observed
100	8	11	30	49
200	3	19	18	40
300	10	18	7	35
400	5	12	13	30
M.sc	–	7	6	13
Total	26	67	74	167
%	15.6	40.1	44.3	100

Source: Field work 2016.

Table 7. Percentage distribution of score interval on statistical diagram test question in the various level of study

Level of Study	100	200	300	400	M.sc
% Score Interval	%	%	%	%	%
0–4	16.3	7.5	28.5	16.6	–
5–8	22.4	47.5	51.4	40.0	53.8
9–12	61.2	45.0	20.0	43.3	46.1
Total %	100	100	100	100	100

Source: Field work 2016.

Table 8. Percentage distribution of lecturer response

Points	Response		Total	%		%
	yes	no		yes	no	total
Interest	13	–	13	13	–	100
Difficulties by student	12	1	13	92.3	7.7	100
Difficulties by lecturer	3	10	13	23.1	76.9	100

Source: Field work 2016.

lecturers in the school. Using questionnaire by which 15 were distributed and a total of 13 recovered. This was done in order to seek their personal opinions concerning cartographic method in respect to student interest in the subject; problems encountered using cartographic method in illustration of research data. And also how long have they been involved in teaching cartographic method as well proffer solution that will improve student's ways of using cartographic method in terms of representation and interpretation.

From the finding of the research, based on interest on the subject or course, and students difficulties using cartographic method and problem encountered using cartographic method in illustration of research data. It was recorded that the 13 lectures where on the opinion that students usually find it interesting teaching cartographic method (accounting for 100% of the 13 responses); 12 lecturers opines that students usually find it difficult using the method, while only 1 lecturers was against it (accounting for 92.3% and 7% respectively of the 13 response); 3 lecturers were able to portrait the fact, that they find it difficult or rather usually encounter problem using cartographic method, while the remaining 10 were on the side of seen as stress free (account for 23.1% and 76.5% respectively of the 13 response). All these are shown in Table 8 below.

1.8. Hypotheses testing

For the purpose of the research two hypotheses were tested, they are

1.8.1. Hypotheses 1

H_o: there is no significant relationship between the level of study and information represented using cartographic method for research data illustration.

H_i: there is significant relationship between the level of study and information represented using cartographic method for research data illustration.

Using the spearman's rank correlation for the analysis, the test revealed that the calculated t value (8.53) is greater than the tabulated t value (2.35) at 5% level of significance it therefore means that the said test is much significant. As a result of this we reject the null hypotheses and accept the alternative hypothesis, thus the result portrait that the level of study has an important role to play regarding student ability using cartographic technique for research data illustration. This is also evident in that the rs value (0.98) depicts a strong relationship between levels of study of student in Delta State University Abraka affect the amount of information represented using cartographic technique.

1.8.2. Hypotheses 2

H_o: there is no significant relationship between the amount of information extracted using statistical diagram and statistical map as a way of illustrating research data

H_i: there is significant relationship between the amount of information extracted using statistical diagram and statistical map as a way of illustrating research data

Using the student t test for the analysis, the test revealed or showed that the calculated t value (0.00) is less than the tabulated value (2.78) at 5% level of significance, this therefore mean that the test is not significant. As a result we accept the null hypotheses.

2. Summary of finding

The aim of this research was to access the effectiveness of cartographic method as a tool in illustration of research data, by students in different level of study of delta state university Abraka.

In summary cartographic method serve as an efficient means of representing and interpreting with this, it is obvious that cartographic method is worth it according to it virtue since it was revealed in the findings that despite most student low level of study (100 level), they could still be able to represent and extract data, this was all shown in the general score of respondents.

Totally from the findings, student's response to the cause effect relationship and inference revealed that as the level of study increase the level or ability of

cartographic method also increase. This could be as a result or their level of exposure to statistical diagram and statistical mapping. This could also be noted that some 100 level students are seeing such maps and diagram for the first time.

Based on this finding, on long bridge of inequalities of cartographic method usage in research data illustration, can be bridge on the following recommendations.

2.1. Recommendations

It is important again to portrait that the low ability of students from 100 level to M.sc level of geography department in cartographic method uses is a crucial problem to the society at large. This will also interest you that, the said technique also plays a vital role in the development of geographic knowledge. Based on this great development, it is believe that some form of improvement may be affected in the study area and other area. With this already discussed, the following recommendations are look into or should be looked into.

One, based on the essentiality of cartographic techniques, textbooks and other geographic teaching aids which include globes, atlases, projectors, surveying equipment should be made available to students especially to the geography student. Introduction of cartography at the lower level right from senior secondary school to 100 level should be encourage to make the student aware of the importance of map.

Two, there should be an integration and fusion of statistical diagram and maps (cartographic method) in teaching geography and this should be incorporated into the geography curriculum by the Ministry of Education and Nigeria University Commission this will help explain real life situations, area differentiation, cause/effect relationship and data collected by student/researcher.

Thirdly, the cartographic method statistical diagram and maps, although introduced from foundation classes, it should be a continuous process from 100 level to the M.sc level, even beyond this level. This can be done through the Nigeria University Commission policies.

Also training of lecturers toward this course could be carried out by the Nigeria Cartographic Association, the Ministry of Education, the Government and other allied association through seminars, workshop and internship programs. This will help the lecturers/instructors of various schools to be impactful in passing the knowledge gained from training, seminars, and workshops to the students without doing it by chance.

It is also pertinent to know that competitions regarding this should be organize and encourage within various level of study in a particular school as well among schools (University), either by the Nigeria Cartographic Association and schools that will help the students think outside the box to achieve the scope and building the entrepreneur skills of the students.

Another point, private investor should come to the aid and invest properly in the University system in the area of practical knowledge like cartography, remote sensing and GIS.

Lastly, the government also have a crucial role to play, the government should help to improve in mapping technology in the country, the NIGERIA SAT, is a major stepping stone in the right direction, man power development should be intensifies in the area of mapping in Nigeria. There should also be accurate and proper implementation of mapping policies in Nigeria, though in a large scale, it will surely affect the students of cartography even geography and other courses.

Conclusions

Despite the rough level of difficulties and constraints that may be involved in the implementation of some of the listed recommendations. However to this regard, the researcher call for the mutual co-operation of the government at all levels, Non-Governmental Organisation (NGO), the ministry of Education and its commissions, the school authorities and students to work hard and collectively in achieving the above stipulated recommendations. On the whole it is the candid opinion of the researcher that if the recommendations out forward are fully implemented by all stake holders, a meaningful improvement will undoubtedly been attained. There will in turn bring about an improved ability of students to represent and extract information from map as well the use of cartographic method for research purpose.

The content of this research is the effectiveness of cartographic method as a tool in illustration of research data, with special reference to geography students of Delta state University Abraka based on their ability to represent and extract information from diagram and maps.

The researcher therefore suggest that further studies on this topic should avail to cover areas of techniques of statistical diagram and statistical mapping and also the way symbols are also represented with particular reference to shape, size, form, proportion and relationship of such features. Also studies can be

carried out in other university, agencies and countries, this will help in making empirical comprises of result between university, agencies and countries, with regard to their constrains.

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